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Epidemiological studies of human fascioliasis among selected individuals in northern Bauchi state, Nigeria

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Abstract
Ranked under the food/plant Trematode zoonoses, human fascioliasis is now regarded as a neglected tropical disease. Despite its worldwide appearance, data on the prevalence of this disease from several African countries is lacking. Studies on the epidemiology of human fascioliasis in northern Bauchi state was carried out to access prevalence and general level of awareness about the disease. 400 random stool samples from patients who visited a centrally placed hospital were analyzed using formol ether concentration technique. A semi structured questioner was also administered to adults above the age of 20 years. The results indicated a total prevalence of 3.5% among patients with significant difference between sexes. Level of awareness on fascioliasis was generally low, 79% of the respondents never heard of the disease before this survey. Public awareness campaigns and follow up prevalence studies were recommended.
Keywords: *epidemiological; fascioliasis; human; prevalence.*

Introduction

Fascioliasis is caused by two important animal pathogens; *Fasciola hepatica* and *Fasciola gigantica* that live in the liver and bile ducts of sheep, cattle and other animals including humans (Cheesbrough, 2005).

Fascioliasis has the widest geographical spread of any emerging vector-borne zoonotic disease, occurring in more than 51 countries spread across all continents especially where sheep and cattle are reared (CDC, 2013). Epidemiological analysis of human and animal Fascioliasis has been carried out in different parts of the world including Nigeria, and the general results indicated that 91 million people are at risk worldwide (WHO, 2016). The World Health Organization further estimates that more than 2.4 million people are infected worldwide. Fascioliasis is therefore a serious infectious parasitic disease of ruminants and humans which tops all the zoonotic helminths worldwide (Haridy et al., 2002).

The life cycle of Fascioliasis is complex, requiring a definitive host, an intermediary host and a carrier. The cycle starts when an infected animal defecate in fresh water sources, as matured worms live in the bile ducts of such animals, releasing immature eggs that hatch into larvae (miracidium) which then infects a snail host (*Galba truncatula*). Under optimal conditions, the development in snail is completed in 5 to 7 weeks, cercariae are then shed in the water and lose their tail to encyst as metacercariae on water plants (Watercress and

other vegetables). The metacercariae are then ingested by ruminant animals or humans (CDC, 2013). In humans, maturation from metacercariae into adult flukes takes approximately 3 to 4 months (WHO, 2016).

Historically, eggs of *Fasciola hepatica* have been found in mummies, indicating that human infection was occurring as early as Pharaonic times (Farag, 2001). Globally the disease constitutes a major source of economic losses in billions of dollars to farmers.

Fascioliasis is a global disease and human cases have been reported from more than 75 countries including Nigeria.

Reported clinical cases of human fascioliasis caused by *F. hepatica* as well as of infected persons identified during epidemiological surveys have increased significantly since 1980 (Mas Coma, Esteban and Bargues, 1999). An elaborate review by Esteban, Bargues and Mas Coma (1998) compiled a total of 7,071 human cases from 51 countries over 25 years distributed accordingly: Africa (487) cases, America (3267), Asia (354), Europe (2951) and Oceania(12). They however suggested that, the true number of human cases is undoubtedly much greater than that reported.

In Egypt, a number of scholars had reported both prevalence and other epidemiological aspects of fascioliasis. Hassan, Hussein and Khalifah (2009) reported an overall prevalence of 30.3% from a coprological surveys on animal and human fascioliasis in Qena Governorate Upper Egypt.

Aims and Objectives

The study aim to evaluate the following:

i. Prevalence of human fascioliasis among selected individuals within the study area.
ii. Effect of sex on the prevalence among selected patients
iii. Level of education and awareness on the prevention and control of fascioliasis.
iv. Recommend steps to be taken in order to raise awareness about the dangers of the disease and its possible control measures.

Materials and Method

Study Area

Bauchi state is located between latitudes 9° 3' and 12° 3' North and longitudes 8° 50' and 11° East. It covers a total land area of 49,119 km² representing about 5.3% of Nigeria's total land mass. Bauchi North Senatorial District is made up of seven (7) of the Twenty(20) Local Government Areas of Bauchi state, comprising Gamawa, Giade, Itas-Gadau, Jama'are, Katagum, Shira-Yana and Zaki LGAs. They make up a total land mass of 9, 717Km² with a total population of 1, 512, 677 according to 2006 National Population estimates. The people are predominantly farmers and major tribes include Hausa, Fulani, Larawa, Kanuri, Kare-Kare and Tashenawa.

Sample and Sampling Technique

With the ethical permission of the Local Authorities, using systematic sampling at the interval of two, 400 random stool samples were collected from patients who visited a centrally placed local hospital. Patients consent and permission were obtained to run an additional concentration technique to detect presence or otherwise of *Fasciola spps* in the stool samples as none of the patients was initially diagnosed for Fascioliasis.

Patients whose stool samples tested positive initially, were asked to provide second and third stool samples for confirmation.

Inorder to evaluate the level of awareness about fascioliasis among individuals living within the study area, a semi structured questioneer was allocated randomly to 400 persons above the age of twenty (20).

Stool Analysis

First all stool samples were initially examined primarily classified and recorded as formed, semi formed and unformed or watery. About 2g of each stool sample was transferred into a test tube containing 3mls of distilled water. The sample and the distilled water were strained to give a suspension. The filtrate was then poured into test tube, 1ml of 10% formalin was then added to it

and allowed to stand for 5 minutes. The test tube was corked, mixed thoroughly and centrifuged at 2000 rpm for 8 minutes.

The eggs of parasite which are large in size were seen to sediment at the bottom leaving the fecal debris separated by a layer. The supernatant liquid was then decanted. A drop of the final sediment was put on a glass slide and covered for viewing.

Statistical Analysis

A two way ANOVA (Analysis of variance) was conducted to examine the prevalence of *Fasciola spp.* among selected people who visit a centrally located hospital within the study area. While one way analysis was used to determine the effect of sex on the prevalence of fascioliasis among selected patients. And Pearson's product moment correlation was used to determine the relationship between the socio-demographic characteristics of the respondents and prevalence of infection; and level of awareness of Fascioliasis infection among respondents.

Results

Out of the 400 stool samples analysed, only 14 were found to be positive for fascioliasis, giving a total prevalence of 3.5%. prevalence was highest among age group 6-10 years and was lowest among age group 51-60 and above 60 years (0%).Prevalence of Fascioliasis among selected people who visit a centrally located hospital within the study area was statistically significant $p = 0.054$. There was statistically significant difference between age-group 0-5 and 11- 20 years $p = 0.039$, but there were no differences between age groups 0-5 & 6-10 years $p = 0.665$, 0-5 & 21-30 years $p = 0.999$, 0-5 & 31-40 years $p = 0.983$, 0-5 & 41-50 years $p = 0.999$ and 0-5 and 51-60 years $p = 1.000$.

Effect of sex on the prevalence of fascioliasis showed that male individuals were more infected. Out of the 136 male stool samples examined, (08) were found to harvour the parasite, giving a prevalence percentage of 5.9%. Only six(06) female stool samples were found to be positive across all the age groups. However, effect of sex on the prevalence among selected patients did not differ significantly, p = 0.063 (Table 2).

It is important to note that, none of the patients sampled was at the hospital for symptoms related to fascioliasis initially.

Data presented on table 3 showed the socio-demographic characteristics of the respondents. More than 50% of the respondents were between the ages of 20-29 years (54.5%) a typical characteristic of an overgrowing population. Few respondents (22) fell above 50 years of age on the random sample. There was significant correlation at the 0.01 level among the age groups (table 3).

There were more male respondents (315) than females (85), a feauture also common among Nigerian communities. There was significant correlation at the 0.01 level among the age groups (table 3). There was significant correlation at the 0.01 level between sex and infection in the study area (table 3).

With regards to educational status, 17.5% of the respondents were without any form of formal education. 37.3% had only attended the basic primary school certificate. 28.0% had up to secondary school education. Only 17.3% had post secondary school education while 7.0% were graduates and postgraduates There was significant correlation at the 0.01 level between educational status and infection (table 3).

Farming appeared to be a predominant occupation, as 40.5% of the respondents were subsistant farmers. There was also significant correlation at the 0.01 level between occupation and infection (table 3).

79.0% of the respondents never heard of fascioliasis before. This indicated that public awareness campaigns were either low or absent at all. Only 62 of the 400 respondents heard of liver flukes infection before. 5.5% of the sampled population were undicided on this issue.

Out of the total individuals sampled, only 188 (47%) believed that fascioliasis can infect humans. 211 (52.7%) do not believed that fascioliasis can infect human population.

Basic knowledge regarding the mode of transmission of the disease also appeared to be low, 50% of the respondents do not accept that fascioliasis can be transmitted to humans through consuming raw unwashed vegetables. This indicated presence of a high risk factor among the sampled population. More than half the sampled population (54.5%) do not okey the fact that fascioliasis is zoonotic.

Knowledge about mode of transmission of any disease is necessary for an effective prevention/control strategy. 247 of the respondents representing 61.7% were not aware that land snails are involved in transmission of fascioliasis.

Meat inspection is an essential tool for reducing the rate of infection was okeyed by 44.3% of the respondents. This was possibly due to the fact that fascioliasis is only believed to be linked with animals that are killed for meat consumption only. An attractive percentage of the sample (21.0%) chosed to remain undicided on this aspect. There was significant correlation on the level of awareness on *Fasciola spp.* infection among respondents at the 0.01 level among the age groups (table 4).

Table 1.0: Prevalence of fascioliasis among selected people who visit a centrally located hospital within the study area (N=400)

Age group (Years)	Number Examined	No. Infected	%Prev.	95% Confidence Interval
0-5	108	01	0.9	-0368-0.1264
6-10	74	04	5.4	-0.1264-0.0368
11-20	61	06	9.8	-0.1757-0.0025
21-30	42	01	2.4	-0.1129-0.0838
31-40	23	01	4.3	-0.1584-0.0900
41-50	41	01	2.4	-0.1144-0. .0841
51-60	39	00	0.0	-0.0826-0.1012
>60	12	00	0.0	-0.1379-0.0891
Total	400	14	3.5	

p= 0.054

Table 2: Effect of sex on the prevalence among selected patients

Sex	Number Examined	No. positive	%Prev.	95% Confidence Interval
Female	264	06	2.3	-0.074-0.002
Male	136	08	5.9	-0.002-0.074
Total	400	14	3.5	

p= 0.063

Table 3: Socio-demographic characteristics of the respondents

	Variable	Frequency (N=400)	%	Age in years	Gender	Education	Occupation
Age (years)	20-29	218	54.5	1	.801**	.907**	.820**
	30-39	76	19.0				
	40-49	84	21.0				
	50above	22	5.5	400	400	400	400
Gender	Male	315	78.8	.801**	1	.760**	.579**
	Female	85	21.2	400	400	400	400
Education	No formal education	70	17.5	.907**	.760**	1	.843**
	Primary school Cert.	149	37.3				
	SSCE	112	28.0				
	OND/NCE	41	10.3				
	B.sc/HND/Postgraduate	28	7.0	400	400	400	400
Occupation	Farming	162	40.5	.820**	.579**	.843**	1
	Trading	41	10.3				
	Civil Servant	158	39.5				
	Student	28	7.0				
	No response	11	2.7				
				400	400	400	400

**. Correlation is significant at the 0.01 level (2-tailed).

Table 4: Level of Awareness on fascioliasis infection among respondents

Variable				1	2	3	4	5	6
	Resp.	**Freq.**	**%**	1	.418**	.491**	.562**	.628**	.668**
Ever heard of fascioliasis (liver fluke)	Yes	62	15.5						
	No	316	79.0						
	Neutral	22	5.5						
				400	400	400	400	400	400
				.418**	1	.487**	.537**	.522**	.301**
Meat inspection and personal hygiene are preventive	Yes	177	44.3						
	No	139	34.7						
	Neutral	84	21.0	400	400	400	400	400	400
				.491**	.487**	1	.955**	.857**	.614**
Fascioliasis infect humans	Yes	188	47.0						
	No	211	52.7						
	Neutral	01	0.25	400	400	400	400	400	400
				.562**	.537**	.955**	1	.895**	.587**
Fascioliasis infect humans through eating raw unwashed vegetables	Yes	189	47.3						
	No	200	50.0						
	Neutral	11	2.7	400	400	400	400	400	400
				.628**	.522**	.857**	.895**	1	.648**
Fascioliasis is zoonotic	Yes	166	41.5						
	No	218	54.5						
	Neutral	16	4.0	400	400	400	400	400	400
				.668**	.301**	.614**	.587**	.648**	1
Snails are involved in transmission	Yes	101	25.3						
	No	247	61.7						
	Neutral	52	13.0						
				400	400	400	400	400	400

**. Correlation is significant at the 0.01 level (2-tailed).

Discussion

Out of the 400 random stool samples of patients who attended a centrally placed hospital in northern Bauchi state, North-eastern Nigeria, 14 samples representing 3.5% were found to harbour the eggs of the parasite. The patients were unaware of these parasites and hospitals do not run helminths test for patients except on special occasions. Human Fascioliasis is no doubt a neglected tropical disease (WHO, 2013; Mas-Coma et al., 2014).

Differences between age groups and sexes of the sampled population were significant at 1% probability level. High prevalence observed among lower age groups (6-10 years) may not be unconnected with low level of immunity as a result of lack of experience as documented by WHO (2018). Mas-Coma (2015) further elaborated that in mesoendemic prevalence between 1 and 10% such as this result, 5 to 15 year old children may present higher prevalence (holoendemic).

The sampled communities are predominant farming localities with over 50% of the respondents having low level of formal education. Both factors contribute to human fascioliasis spread. Nyindo and Lukambagire (2015) reported that fascioliasis occur among herding communities in low income countries like Nigeria. Low level of personal education translates to low level of personal hygiene which predisposes an individual to an infection. Low level of hygiene practices contribute greatly to the prevalence of fascioliasis. This trend is likely to operate within the study area.

The results obtained from the semi structured questioner revealed an overall lack of awareness on the source of infection and mode of transmission of fascioliasis. This corresponds with the situation reported from communities in low income countries where fascioliasis was not endemic.

Conclusion

Results obtained from this study revealed that fascioliasis was prevalent among human population living within northern Bauchi state, north-eastern Nigeria. Although the result require further investigations and follow up, it does not preclude the importance of the data obtained for policy makers in the control and prevention of this neglected tropical disease.

Recommendations

(a) Public awareness campaigns targeting health experts, schools and public is recommended in order to improve the level of awareness on fascioliasis and other infectious diseases.

(b) Routine laboratory investigations should include intestinal parasite diagnoses not after the onset of infection.

(c) A regular prevalence study is recommended among humans to provide up to date information on blood flukes and other related infectious disease.

(d) Health expert's knowledge on diagnostic procedures relating to helminths infection need to be updated.

Declaration

We declare that there is no complicit of interest and both authors have read and agreed on the contents.

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